STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA

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16. Abstract

The program to study Short-Lived Events with the ERTS satellite has evaluated 97 events reported by the Center for Short-Lived Phenomena. Forty-eight of these events were listed as candidates for ERTS coverage and 8 of these were considered significant enough to immediately alert the ERTS operation staff by telephone.

We have studied the images received from six events and find that useful data on short-lived events can be obtained from ERTS that would be difficult or impossible to obtain by other methods.

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TYPE II REPORT

SEPTEMBER 1972 - FEBRUARY 1973

STUDIES OF IMAGES OF SHORT-LIVED EVENTS USING ERTS DATA

Submitted by: Dr. William A. Deutschman

Introduction:

The program to study short-lived events eith the ERTS satellite is progressing well. Through the end of February we have evaluated 97 reports of events from the Center for Short-Lived Phenomena and issued 48 Event Notification Reports. Eight of these events were classified as major events and immediately TEX's or telephone calls notified the ERTS project of their occurrence. Table 1 lists these events and gives a history of the subsequent action regarding them. Six of the events have been extensively studied and techniques for rapid analysis of future events were developed. We have been able to detect old and new forest fires; oil spills and volcanic activity. We are currently awaiting data on a major earthquake in China, a storm ridge in the Pacific, several oil spills and two regions with major flooding. Finally, we designed and sent a brochure to all of the Center for Short-Lived Phenomena correspondents.

Table 1

Name of Event	Date of Occurrence	Comments
Sakurazima Volcanic Eruption	October 72	Pictures received and analyzed
Piton Volcanic Eruption	June 72 and cont.	Pictures received, preliminary analysis
Typhoon Bebe	October 24-25	No pictures taken because of clouds
Manozua Earthquake	December 23	Pictures received, preliminary analysis
Funafute Storm Ridge	October 20	Pictures taken but not received
Helgolell Volcanic Eruption	January 23	Pictures received, preliminary analysis
Szechwan Earthquake	February 6	Pictures taken but not received
Asama Volcanic Eruption	February 1	Pictures taken but not received

Six events for which we have received complete coverage have been studied to determine the amount of information and the detectability of events. These events include forest fires, volcanic activity, oil spills and vegatation damage. Preliminary work has been started on major flooding and earthquake damage.

The forest fire pictures show that we can easily detect fires that are two years old and in some cases three year old fires. The area burned can be measured and provides data that are two to three times as accurate as the estimates now used to determine the fire areas. The progress of one fire was measured because of its long life and the repeated coverage of the satellite at high latitudes. We believe that significantly better statistics on the area, history, and number of fires in remote areas could be obtained by using our techniques to search for and measure fires.

We are studying three active volcanic areas; Helgafell, Iceland; Piton de la Farnaise, Reunion Island; and Sakurizima, Japan. These volcanoes have had significant ash or lava flows. We have been able to easily detect the smoke and possibly some ash activity. The volcanoes with extensive lava flow have not been studied because of high cloud cover on existing shots.

The San Juan oil spill was detected by comparing shots before and after the spill and by noting the changes in the reflectness of the river in MSS bands 5 and 7. Approximately two miles of river behind a division boom were affected. The boom and associated debree is easily seen in the MSS7 band.

Stuides of the Minami Palm Yellowing, our only vegatation event, were unable to detect any effect. This is due to the low density of the Palm trees in the area and the low resolution capability of ERTS. Very few palm trees exist in a clump as large as one resolution element.

New Technology

We have developed a technique for comparison of two different ERTS frames using a Grub Parsons Blink Microscope. The microscope alternately flashes each scene in registration in the microscope and hence features that change either in shape

or spectral signature flash on and off. Two frames taken at different times or two different bands at the same time may be compared this way. Changes in physical shapres or changes in relative spectral response can be detected at a glance. We are able to separate dark spectral features from clouds or terrain shadows. This procedure makes use of common astronomical equipment and is a quick technique to use to scan an entire frame for specific features. We have also used a microdensitometer to digitize selected areas on the ERTS frames and then analyze them digitally with the computer. This technique eliminates the problem of processing the vast amount of data contained on digital tape as only the area of interest is scanned.

Program for the Next Reporting Period

We intend to continue our investigation as we have in the past. Further investigation will be conducted on the existing events to determine if more information can be extracted from the images. We also expect to work on a number ofspring related short-lived events including floods. One major area of interest will be the continued investigation of the Alaskan fires. We will be able to examine known burn areas one year later and determine how accurately old fires can be measured and how the vegatation recovers in the fire area.

Conclusions

We conclude that the ERTS system provides a feasible way to study short-lived events. The information gained from the images would be difficult to obtain by any other means (except for aerial overflights). Short-lived events can be detected from the images but currently the time lag between the acquisition and desimination of the images is too long for useful alert messages.